

A
PROPOSAL
TO
Perform Musick,
IN
Perfect and Mathematical Proportions.

CONTAINING,

- I. The State of MUSICK in General.
- II. The Principles of PRESENT PRACTICE; according to which are,
- III. The Tables of PROPORTIONS, calculated for the Viol, and capable of being Accommodated to all sorts of Musick.

By *Thomas Salmon*, Rector of *Mepsal* in
the County of *BEDFORD*.

Exemplaria Graeca
Nocturna versate manu, versate diurna.

Hor. de art. Poet.

Approved by both the Mathematick Professors of
the University of Oxford.

With Large REMARKS upon this whole Treatise,
By the Reverend and Learned *John Wallis D. D.*

IMPRIMATUR. *Gilb. Ironside*, Vicecancell. Acad. Oxon.

L O N D O N :

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TO
The Valiant and Learned
John Cutts Esq;

*Adjutant General in the Service of His
Imperial Majesty.*

THIS, Sir, is so far from the common road of Dedications, that at first sight it will appear neither fit for me to give, nor you to receive,

Shall a Person so publickly employed in the greatest Attempts, and most victorious Successes, which the World has seen for these many Ages, have leisure for Philosophical Speculations, or divert to a Science proper for ease and pleasure?

Or should one consecrated to the Divine Service, so laboriously search into the Intrigues of Nature, and assist in the advancement of an

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Art, which with its Airy Pleasures often captivates the Soul to sensual things, and makes it more devoted to the World, ~~that is to be~~ conquered with another sort of Victory than your Arms can obtain?

All this I have thought on, yet still find so much in this ~~affair~~, as not only to excuse me, but to make it acceptable to you.

This Mathematical Discourse is indeed the Anatomy of Musick, wherein the infinite Wisdom of the great Creator appears: How delightfully and wonderfully is it made! Marvelous are thy works, O Lord, and that my Soul knows right well.

All the best Proportions, are the best Chords of Musick, and strike the Ear with a pleasure agreeable to the dignity of their Numbers. The effects of this the Sensualist is satisfied with, and desires to seek no further.

But is it not grateful to every Gentleman, who is ennobled with such a Soul

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Soul as yours, to know the divine Harmony of the pleasure he enjoys? Is it not the duty and Felicity of a Rational Being, to consider how the whole System of the World is framed in Confort? How Musical Instruments observe their Arithmetical Laws, all the little Meanders of the Ear faithfully conveying the organiz'd sounds, and the Soul of man made to receive the delight, before he himself knows from whence it comes?

How great is this! How mean am I, to set forth such a Divine Subject!

However charming this still voice may be, yet nobody will believe it can be heard amongst Drums and Trumpets: Why should these Papers hope for acceptance in o'the Camp?

I must confess I should think them unseasonable, had not you, my Excellent Friend, told me that your

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most Renowned General *Lorain* does in all the intervals of Action govern his Army like a Colledge, and allow time for the repose of the Mind, as well as for the over-running subdued Countries.

You may then reflect upon the great Creator and Governor of the World, who gave you being, and now preserves you in the most eminent Hazards; these shall help you to contemplate the infinite Wisdom, and shall be of the greatest advantage to you, since Piety is the best support of Courage, and gives a refreshing Ease amidst the Rage of War.

But the design of War is Peace, and your Friends here long for the return of those cool hours, wherein you may not only have leisure for these Theoretical Studies, but advance true Practical Wisdom; which you have already represented to us in the most advantageous dress, and inflamed our desires to have her interest

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terest promoted to greater Heights.

I know the glory of the Field is very tempting, but still you retain as great a passion for Learning, this hath ever found a place in the noblest Breasts: The first great Conqueror of this Island is as glorious for his Pen as his Sword, and by his Commentaries perpetuated his Victories.

We have incomparably more of *Athen*s here in *England*, than your Confederates the *Venetians* this year I got possession of: That ancient Treasury was long ago rifled, and its Jewels brought into the Western part of *Europe*: this the learned Proprietors were very sensible of.

When *Cicero* return'd home from *Greece* by *Rhodes*, the famous Orator there *Apollonius* begg'd the favour of a Declamation: All the Company were amazed, and strove with the highest Expressions to acknowledge the Obligation; but *Apollonius* sat sad and silent: which when he perceived

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Cicero took amiss, he said, Σινάδη, ὁ Κακός, ἀποτελεσματίων, τῆς δὲ Ἑλλήσθεον περιπέτειαν τῶν πόλεων, ἡρῷον καὶ μετρίᾳ τῶν γενεῶν ἡμῖν
αποτελεσματίων, καὶ τοῦτον Παυκάλιον διὰ τοῦ αποστράγγελου, παύκαλον τὸν καὶ λέγον. ‘I
value and admire you, O Cicero; but
in the mean time I must pity the
fortune of Greece, since those excel-
lent Goods, Learning and Elo-
quence, (which were all that was
left) are now by you brought o-
ver to the Romans. *Plutarch*, in the
Life of Cicero.

The Offers made in these Papers,
are the Musical Spoils and Relicks of
Athens, a long time buried in obscu-
rity; and though some years ago
published to the World in their own
Language, yet never known to those
whose greatest concern it was to be
acquainted with them.

And indeed Mufick now very much
wants such Patrons as you are, whose
Reverence to Antiquity and Learn-
ing, may give Preheminence to the
Nobler part; which would at once
both advance and regulate the Practick
Pleasures. It

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It must be acknowledged that this Divine Science has a great while sunk with the Devotion of Churches, it has been little learned and little regarded by the Religious ; so that the Angelical Praises, which we have the honour to communicate in upon Earth, are faintly and unfrequently celebrated : This celestial accomplishment, which God ordained to enliven our dull Affections, is everywhere wanting ; that the pleasure is as low as the skill of performing this most grateful part of Worship.

Hence has Musick of late sought its principal Glory in Theatres, and sensual Entertainments , too mean a Service to be reckoned the designe of such an excellent Art : The infinite Wisdom created it for better purposes.

And when God shall please to bless the World with greater degrees of Love , and a better Adoration of himself, He will raiſe up Men
and

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and Means thus to promote his Glory. Which directs me now to seek your Patronage to the Endeavours of,

SIR,

Mepsal, Nov. 1.
1687.

Your most Humble and
most
Affectionate Servant,

THOMAS SALMON.

Adyertise-

Advertisement

To the READER.

I Would not suffer this Proposal to be published, till I had first communicated it to the most eminent Professors of this Science, because having omitted the demonstrations I rely upon, the Reader might be satisfied in their Testimonies.

I know it is not fair to offer any thing in Mathematicks, without giving the Demonstration with it as we go along ; but I considered that the Principles of this Science are very little known, and would not have been much regarded by Gentlemen, till they first had seen the use and necessity of them.

As I thought this the best course, so it has proved much better than I expeded : for the most experienced Professor in this part of Learning, hath sent me not only his Approbation, but his Demonstration of my Principles ; from whence the more inquisitive Reader may receive a compleat satisfaction.

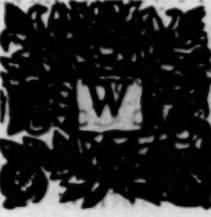
E R R A T A.

- Page 6.—Line 16. for intension read intention.
7.—*Penult.* for Six read Sixth.
10.—24. for there read these.
13.—*Ansepenult.* insert the word add.
23.—7. for Numb. III. read Numb. IIII.
27.—18. insert the word cross.
Uk.—*nts.* two *Iota's* subscripts are wanting.
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A PROPOSAL To perform Musick, IN Perfect and Mathematical Proportions.

CHAPTER I.

Of the State of Musick in General.



HEN the great Empires of the World, were in the height of their Glory, especially the *Grecian* and *Roman*, (whose Authors have left us lasting Monuments of their Excellency) Then did all sorts of Learning flourish in the greatest Perfection: The Arms of the Conquerors ever carrying along with them Arts and Civility.

But to bring about a fatal Period, did the *North* swarm with barbarous Multitudes, who came down like a mighty Torrent, and subdued the best Nations of the World; which were forc'd to become Rude and Illiterate, because their New Masters and Inhabitants were such.

B

Amidst

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Amidst these Calamities, no wonder that Musick perished : All Learning lay in the Dust, especially that which was proper to the Times of Peace.

But this Darkness was not perpetual ; The Ages at last clear'd up ; and from the Ruines of Antiquity, brought forth some broken Pieces, which were by degrees set together ; and by this time of day are Arriv'd near their ancient Glory. *Guido* has been Refining above Six Hundred Years.

Two things are chiefly conduced to this Restoration : The great Genius of the Age we live in, and the great Diligence in searching after Antiquity : The excellent Editions of the best Authors, and the most laborious Comments upon them, abundantly testifie the Truth of this.

In both these Felicities, Musick has had as great a share as any ; *Aristoxenus*, *Euclide*, *Nichomachus*, *Alypius*, *Bacchius*, *Gudentius*, *Aristides*, *Martian*, have been with a great deal of Diligence, set forth by *Marcus Meibomius*, at *Amsterdam*, in the Year 1652.

And above all, is, *Claudius Ptolomeus*, who Correc^ted and Reconciled the *Pythagoreans*, and *Aristoxeneans*, the speculative and practical Parties : This Author was Published by Dr. *Wallis*, at *Oxford*, in the Year 1682, who added an Appendix, comparing the Ancient and Modern Harmony ; which is as the Key to all our Speculations, and without which the former Authors were hardly Intelligible.

Nor are we less beholding to the Excellent Genius of our Modern Musicians : There are, indeed, only two Fragments (as I know of) remaining of the ancient *Grecian* Compositions ; One of *Pindar's*, found by

by *Kircher*, at *Messana* in *Sicily*; the other of *Dionysius's*, rescued by Dr. *Bernard*, from lying hid amongst some Papers of Arch-Bishop *Usher's*; both Published with *Chilmeads Notes* in the end of *Aratus*, at the *Oxford Theatre*: These are very short, and very imperfect, and therefore we cannot make any Judgment of their Songs or Lessons.

But by all that we can discern from their Harmonical Treatises, There never was such regularity in the designing of Keys, such a pleasing sweetnes of Air, such a various contexture of Chords, as the Practical Musicians are at this day Masters of.

It may seem now, that there remains nothing to be added, or to be learn'd out of those Eminent Authors I have here Recited; And the mighty Power of Musick, Recorded by the most Grave and Authentick Historians, may be lookt upon as Romance, since all the Excellencies now perform'd, cannot conquer the Soul, and subdue the Passions as has been done of Old.

But before we quit the Testimonies of what Musick has done, and despair of any further Advancement; Let us enquire whether there be not something very Considerable still wanting, something Fundamental very much amis, even that which the forementioned *Philosophers* were likely to be most Excellent at, when the Learned and Practical Part were met in the same Persons: Whether this be not the Accurate Observation of Proportions, which the Soul is from Heaven inform'd to Judge of, and the Body in Union with it, must Submit to.

Surely, I need not prove, that all Musick consists in Proportion; that the more exact the Proportions,

the more Excellent the Musick : This is that, all the World is agreed in. For this, I have every Man of my side, that except the Voice, the Instrument be well in Tune, the best Composition that was ever made, will never please ; And what is it to be in Tune, but for every Note to bear a due Proportion to one another ?

Indeed , the Proportions of Musick are twofold ; First, In respect of Tune, and Second, In respect of Time : The latter of these, which Dr. *Vaffins* contends so much about, is certainly very considerable ; that the Musick should agree with the Poetical *Prosodia* ; that all the Variety of Rythmical Feet should have their proper Movements.

Then would the Sense be favoured by such Measures, as were most fit to Excite or Allay the Passions aim'd at ; and the Words of a Song would be capable of a more easie and intelligible Pronunciation.

Since Musicians have not undertaken to be Poets, and Poets have left off being Musicians ; this now disjoyned Work , of making Words, and setting Tunes to them, has not been so exactly done as formerly, when the same Author perform'd both.

But were it never so well done for Time, and the Proportions of Tune neglected ; it could signifie nothing : None will pretend to make Musick by playing good Time, except the Instrument and Voice be in Tune.

However, till both these Fundamental Points be observed with such Exactness and Excellency, as the Ancients took care of ; we must not say we do all they did, or that they could not prevail more than we can ; all the Modern Excellencies may be render'd Ineffectual, by

by tolerating so many unproportionate imperfections, as are every where found amongst us.

I shall not here give an account of all those accurate Proportions, which the Ancients contended for, nor their little enharmonical Distances, whereof their more curious Musick did consist; but only of what is now practised amongst us, that the certain Knowledge of our Fundamental Principles may produce Performances, much more exact and powerful.

CHAP. II.

The present Practice of Musick.

THE Hours of Study are tedious to some and precious to others: I cannot therefore suppose any man will search into the demonstrative Reasons, or acquaint himself with the Mathematical Operations belonging to this Proposal, till he be first assured of the truth and usefulness of it.

So that what is purely Speculative shall be reserv'd at present: This offers nothing but the Principles of continual Practice, whereby the Reader may be lead into the knowledge of what he is always to design; and taking the String of any Instrument, may give his Eye, and his Ear, and his Reason, an immediate satisfaction, in all that is here dictated to him.

Before we compose or perform any Musick, two things must be provided for.

I. That we have some little gradual Notes, which may

may (whilst the Voice rises or falls) succeed one another in the best Proportions possible ; whereof (as of so many Alphabetical Elements) the whole Musick must consist.

II. These gradual Notes must be placed in such order, that the greater Intervals (compounded of them) may in the best Proportions possible arise out of them, and be come at with the greatest conveniency : That in all the Points, where the single Notes determine, there the larger Chords may be exactly coincident ; if it was not for this, there could be no Consort-Musick.

To set forth this , we may as well use the first seven Letters of the Alphabet, as all the hard Names of *Guido's Gamut* ; because they were framed long before Musick was brought into that good order wherein it now stands, and the first intension of them is not agreeable to the present practise.

Only this will be worth our Observation, that whereas in the Scale of Musick, there are three Octaves, (besides the double Notes and Notes in Alt) viz. the Base, Mean, and Treble , we may use Three Sizes of Letters in a greater, middle and lesser Character : as will be found in the Tables of Proportions.

For understanding the two things pre-required, we suppose the proportion of one gradual Note to be contained between A and B , then between B and C, the proportion of another gradual Note, though much lesser ; these two single proportions, viz. that of A B, and that of B C being added together, must exactly constitute a lesser Third ; the proportions of the two gradual Notes must determine in that point, where the compounded interval may be coincident with them.

To

To proceed, if we add another gradual Proportion from C to D, then must arise the exact proportion of a Fourth, from the first given A to the Note D: if one more be added from D to E, there must be found the exact proportion of a Fifth, from A to E, and of a greater Third from C to E.

Thus must the Gradual Notes be contrived to be exactly subservient to the greater intervals thorough all the Octaves: and if at any time this cannot be (as may happen in two or three instances) such particular Chords must be esteem'd inconcinnous and inconvenient, but they are very few, and lye much out of the way.

If we settle one Octave, the whole work is as good as done; all the rest is only repetition of the same Notes in a larger or more minute figure: for the eight Notes which are used in constant practise, proceeding gradually, take up just half the string, from the sound open to the middle of it: And if we have occasion to go further, 'tis but just the same over again.

The great concern is in what order our gradual Notes (which are of different sizes) must stand, from the Key or Sound given, till we arrive at the Octave; for there will be a great variety, according as the lesser gradual Notes are placed sooner or later: This must be lookt upon as the internal constitution of an Octave, which practical Musicians commonly understand by their Flat or Sharp, that is, their greater or lesser Third.

But as much as I can observe from the Compositions of the most Eminent Masters for these last Twenty years, this internal constitution of an Octave is but twofold: either with a greater Third, Sixth and Seventh; or a Lesser Third, Six and Seventh: In the same composition all are lesser, or all greater. There

There needs then only this twofold constitution of the Octave to be considered by us; the two Keys A and C: all the rest serve only to render the same series of Notes in different pitches; which is demonstrable by transposing Tunes from one Key to another: The Tune remains the same, only the compass of the Voice or Instrument is better accommodated.

These two Keys A and C are called Natural, because the Proportions, originally assigned to each Letter, keep those proper places, which either *Guido* the first restorer or immemorial Custom hath allotted to them; Whereas by taking other Keys, as suppose G for A, the proportions or different fizes of the gradual Notes are forced to shift their quarters, and by flats or sharps to straiten or widen their usual distances.

'Tis sufficient demonstration for all this, that when any Tune is transposed into A or C, it wants no flats nor sharps, whatever it did before.

I shall in the first place give you the natural order of the gradual Notes as they stand in the Key A, where we have a lesser Third Sixth and Seventh, exactly coincident with the Third Sixth and Seventh gradual Note.

You have between every Letter, that part or proportion of the string assigned which each gradual Note requires: underneath you have the proportion of each compounded interval, what part of the string it's stop must be when compared with the whole string open from the Nut to the Bridge.

The Constitution of the Key A.

A. 9. B. 16. C. 10. D. 9. E. 16. F. 9. G. 10. a.

A Lesser Third---6

A Fourth-----4

A Fifth-----3

A Lesser Sixth-----4

A Lesser Seventh-----5

An Eighth-----2

The Experiment must be thus : You are to take any one String, and suppose it to be the Key A, when it is open : then measure the 9th part of it, you will have B or one gradual Note. Not that the first Fret must stand there, but the second ; for we are not reckning according to Tableture, but Notes specified by the first Letters of their hard names : the half Notes shall be considered afterwards.

From the place of B measure the 16th part of the remaining String, there will be C, the least gradual Note : And there you will arrive at the 6th part of the whole String, which is the proportion of the Lesser Third ; and the Ear will acknowledge it to be so.

From the place of C take the 10th part of the remaining String, there will be D, another gradual Note, much wider than the last, between B and C, but something less than the first between A and B. At the place of D, you will arrive at the 4th part of the whole String, which is the proportion of a practical Fourth.

C

Here,

Here, to prevent all perplexity and mis-understanding, the Reader must carefully distinguish in the Terms of Art : The Practical Musician reckons how many gradual Notes he has gone oyer from his Key or Sound given, and accordingly calls his Intervals a Third, Fourth, and Fifth, as having so many gradual Notes contained in them ; but the Mathematician regards only the parts of the String, what proportion the part stopped bears to the String open.

Here indeed the Practical and Mathematical Terms are the same, a fourth part of the String mathematically measured, is a practical fourth ; but in all other Chords they differ, as we have seen a Lesser Third to be the sixth part of a String.

From the place of D take the 9th part of the remaining String, (which is a gradual Note of the same proportion with the first, between A and B ;) here will be E, and here you will find you are arrived at the third part of a String, which is the grateful proportion of a Practical Fifth.

The proportions of the Lesser Sixth and Seventh, viz. $\frac{2}{3}$ and $\frac{3}{4}$, are of a different sort from the rest ; the former Chords arise from the natural division of an Octave or Double proportion, there are formed by an artificial addition of a second or a third to the Fifth : The former proportions are called by Arithmeticians Super-particular, these are super-partient.

I believe the Reader will not desire to be troubled with the nature of them here, but only to be informed how to measure them for his present satisfaction : He is to know then, that he must not take the upper number 3 of $\frac{3}{4}$ for the third part of the whole String, for then a Lesser

in Perfect and Mathematical Proportions. 11

Lesser Sixth would be the same as a Fifth; but he is to devide the whole String into eight parts, as the lower number specifies, and then where three of those parts determine from the Nut, there will be a Lesser Sixth.

This is the addition of the 16th part of the remaining String from E to F: for A open to E was the third part of the String, that is a Practical Fifth; from A open to F will be three parts of the whole String divided into eight parts, which is a practical Lesser Sixth.

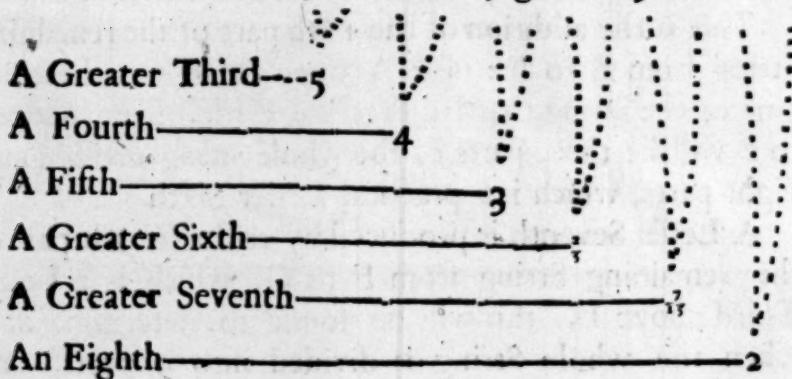
A Lesser Seventh is produced by taking a 9th part of the remaining String from F to G, which is a Lesser Third above E, this will be found to determine at 4 when the whole String is divided into 9 parts, and therefore is the proportion 9.

From G take a 10th part of the remaining String, you will arrive at a, the precise middle of the whole String, so that an Octave is a duple proportion; the fullest and most perfect satisfaction that can be given to the Ear. And by this is the whole proceeding demonstrated to be right, because not only by the way, every interval was exactly found in its proper place, but at last this Chord, the sum total of all Musick, does just contain all its Particulars.

After the same manner may the internal-constitution of an Octave in the Key C be demonstrated: I shall set it down without any explication, because the Experiment and Reason of both are alike.

The Constitution of the Key C.

C. 10. D. 9.E. 16.F. 9.g. 10.a. 9.b. 16. c.



Though we have all along supposed a Monochord or single String, to make this demonstration more evident, and to shew that all the gradual Notes of an Octave put together, arrive just at the middle of the String ; yet the progress of the Proportions is the same, when we take some of them upon one String, some upon another. For each String is tuned Unison to some part of that which went before ; so that 'tis all one whether the Proportions go along upon the same String, or go on to the next, when we come at the place of tuning Unisons.

As suppose upon the Viol the Fourth String be C open, when you come to E, or the Fourth Fret, you have a greater Third ; then 'tis all one whether you take the 16th part of the same String to make F at the fifth Fret, or the 16th part of the next whole String to make F upon the first Fret : 'Tis all one, because the third

third String open is tuned Unison to E, or the fourth Fret upon the fourth String.

As I would avoid troubling my Reader with needless difficulties, so I would not omit any thing of necessary information ; this last consideration makes me here add a discourse of Seconds, which is the name whereby the gradual Notes are commonly called : for reckning inclusively in Musick, one Interval, which must needs be contain'd between two Sounds, is term'd a Second.

It is best to treat of them in that method, which our Authors used in the Classical times, because 'tis their Perfection we are now aiming at : They divided their Musick into three sorts, *Diatonick*, *Cbromatick*, *Enharmonick*, which was so diversified by those several sorts of Seconds or gradual Proportions they used therein.

1. In *Diatonick* Musick, the foregoing constitution of an Octave discovers three several sizes of Seconds, *viz.* the 9th part of a String, the 10th part, and the 16th part. I would satisfie the Reader in this variety, because he will think much to enter upon an Observation, not yet received, except he knows some necessity for it.

We must have the Proportion of the 16th part of the String between B and C, as also between E and F, or we cannot bring our gradual Notes into the form of an Octave, into the compass of a duple proportion ; this is already acknowledged both by speculation and practice : No one ever yet pretended to rise or fall eight Notes one after another, all of the same size.

To this 16th part we must a 9th part, or we can never have an exact Lesser Third, which is the 6th part of the whole String ; but if we add another Note of the same

same size, viz. a 9th part to make up that Lesser Third a Fourth, we shall find that we have a great way over-shot the fourth part of the String, and without taking the 10th part, we can never hit it; as will appear by the former demonstrations upon the Monochord, in many instances.

I must confess, this is so contrary to the common Opinion of Practical Musicians, that I would not insist upon it, did not necessity compel me, did not the greatest Reason and Authority assure me, that it will not be hereafter denied: Of these three sizes of Seconds does the whole progress, from the Key to the Octave, consist in the forementioned order, being all along exactly coincident with the larger Intervals.

My Authorities are *Cartes's Musick*, *Gassendus's Introduction*, *Wallis's Appendix*, and all other Learned men, who have in this last Age reviewed the Harmonical concers. 'Tis time certainly to receive into practice those Improvements, which the greatest Modern Philosophers in the World have afforded Musick.

And indeed 'tis in vain to stand out, Nature always acknowledged and received them; a good Voice performing by it self, a faithful Hand guided by a good Ear upon an unfretted unconfined Instrument, exactly observes them: All that I contend for is, that the Practiser may know what he does, and may always make that his design, which is his excellency.

When we have thus much granted, then may the last Chapter of this Proposal be very acceptable; which puts into his hands the Tables of Proportions calculated for every Key, that he may perform them upon those Instruments, which have not hitherto been capable thereof. But to pursue our present subject.

2. *Chromatick* Musick is that which ascends and descends gradually by half Notes. I don't mean such as is commonly call'd the half Note in *Diatonick* Musick, the 16th part of the String, the proportion assign'd between B and C, between E and F : These are self-sub-sistent, and reckned as two compleat Steps, as well as any of the rest. And if we consider the value of their proportions, deserve rather to be reputed three-quarters than half-Notes.

Chromatick half Notes arise by the division of *Diatonick* whole Notes into the two best proportions, so that they will follow one another, and be all along coincident with the greater Intervals. But those two vulgar half Notes in the *Diatonick* Scale will not do so; 'twould make mad work, to place two or three of these (*viz.*, 16th parts) one after another, you would neither have true Thirds, Fourths, nor Fifths, in your whole Octave; you could not maintain any coincidence with other Intervals.

A *Chromatick* half Note is truly made by placing the Fret exactly in the middle between the two Frets of the *Diatonick* whole Note: This I first learn'd by the mathematical division of an Octave or duple Proportion into its natural parts; then I was confirmed in it by *Aristides*, lib. 3. pag. 115, who requires such a Fund for the *Enharmonical Dieses*, and since upon tryal I find Practical Musicians very much satisfied in the Experiment of such a Division as fully answering their expectations.

I think only this last Age, ever since Musick has began to revive, has aspired after these *Chromatick* Hemitones, and now they are used three, four, or five of them, in immediate sequence one after another; if their proportions

proportions be truly given them, they are certainly the most charming Musick we have : but whereas a natural Genius easily runs into the *Diatonick* Intervals, these are not perform'd without a great deal of Art and Practice.

3. *Enharmonick* Musick is that which ascends and descends gradually by quarter Notes, which the Ancients called Dieses : I don't mean that the whole Octave, either in this or the *Chromatick* Musick, did consist only of these ; but after having used some of them, they took wider Steps and larger Intervals afterwards to compleat the Fourth and Fifth.

I could here add an account of the true *Enharmonical* quarter-Notes ; the same Mathematical Operations produce their Proportions : The Grecian Authors (particularly *Aristides* in the fore-cited place) determine and record them, and they may become practical again ; but I resolve to propose nothing here, but what is of present practice.

This I must say, that those invented for the Harpsichord, are nothing to the ancient purpose : The Harpsichord quarter-Notes are designed only for playing more perfectly in several Keys, with lesser Bearings, which are never used in sequence, so as to hit four or five of them one after another ; but the true *Enharmonick* Scale offer'd its Dieses, as gradual Notes, whereby Musick stole into the Affections, and with little insinuating Attempts got access, when the bold *Diatonick* would not be admitted.

C H A P. III.

An Account of the Tables of Proportions.

IT is very possible, that those, who are devoted only to the Pleasures of Musick, may not care to trouble themselves with the foregoing Considerations: 'Tis not every mans delight to be diving into the Principles of a Science, and to be enquiring after those Causes which produce an Entertainment for his Senses; 'tis satisfaction enough to the greatest part of the World, that they find them gratified.

And indeed the delights of Practical Musick enter the Ear, without acquainting the Understanding, from what Proportions they arise, or even so much, as that Proportion is the cause of them: this the Philosopher observes from Reason and Experience, and the Mechanick must be taught, for the framing Instruments; but the Practiser has no necessity to study, except he desires the Learning as well as the Pleasure of his Art.

I have therefore so Calculated my Tables, that a man may without thinking perform his Musick in perfect Proportions; the Mechanical Workman shall make them ready to his hand, so that he need only shift the upper part of his Finger-board as the Key requires.

This I have tried, and found very convenient; I shall therefore give a Table of Proportions in every Key, that the Mechanick may accordingly make a sett of Finger-boards for each Instrument, according to its particular

D length;

length ; the Proportions ever remaining the same , though the size be various.

It is evident that one Fret quite cross the neck of the Instrument, cannot render the Proportions perfect upon every String ; because sometimes a greater Note is required from the Nut or String open, sometimes a lesser : if then the Fret stands true for one, 'twill be false for the other ; if it stands between both, it will be perfect in neither.

As for example : Take the Viol tuned Note-ways, (which is ever the same) if you look back to the natural Constitution in the former Chapter, you will find that from the String D open, you must take the 9th part of the String ; from the String G open, you must take the 10th part of the String : accordingly the first Fret from D (which is the *Chromatick* or just half the space of the whole Note) must be a great deal sharper, than the first Fret of the String G. And the first Fret of the String E being the least *Diatonick* Note to F, must be a great deal sharper than that which belonged to the String D, or G.

So that every String must have its particular Fret, whose Proportions are here given to the Mechanick, and he is to make use of them to the best advantage : Not that I would confine him to the way of shifting Finger-boards ; 'tis possible the Makers of Instruments may find out some other way much more convenient : Their great excellency and industry in making Organs and Harpsichords, proves them sufficient to accommodate the designs of Musick : I only proposed what I had made use of, to shew that the Experiment is practicable, which is enough for a Scholar to do, whose Province lies only in the Rational part.

As

As I here inform the Mechanick, what Proportions he is to set upon every String, so I must inform the Practiser what Keys he may play in, which is absolutely necessary; for no man can set about performing any thing in Musick, without knowing his Key.

This deserves to be consider'd, that the Writers of Musick may more certainly know where to fix their Flats and Sharps at the beginning of a Lesson or Song, and the number of them that is requisite: for as in Vocal Musick 'tis a vast trouble in Sol-fa-ing to put Mi in a wrong place, so it is in Instrumental Musick, to have an Information renewed in several places thorough the whole Lesson by a Flat or a Sharp, which might have been known at first, once for all.

As for instance, C Key is now often chosen for a Lesser Third; there is no doubt but the Composer would have a Lesser Sixth as well as a Lesser Third, (as appears by the interspersed Flats); if so, there ought to have been three Flats prefixed, that A might be flat as well as E.

I shall in this Catalogue of Keys offer you the variety of fourteen; seven with a Greater Third, Sixth, and Seventh, the other seven with all these Intervals Lesser.

But for these fourteen Keys, you need to have only seven Finger-boards; for when the Proportions are lodged between the same Letters, then there will need no shifting: so that though the Key be different, yet the Instrument must be disposed in the same manner.

As for instance, in the two Natural Keys A and C, the same Finger-board will serve; you begin indeed in two different places, the Key A is a Lesser Third before C, but the series of Proportions required, will be found

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exactly the same for both, according to the foremen-
tioned Internal Constitution.

You may take this following Catalogue of Keys, with
the due Proportions assigned between each Letter.

I.

A. 9. B. 16. C. 10. D. 9. E. 16. F. 9. G. 10. a. 9. b. 16. c.

II. One Flat.

D. 9. E. 16. F. 10. G. 9. A. 16. B^b 9. C. 10. d. 9. e. 16. f.

III. One Sharp.

E. 9. F^{*} 16. G. 10. A. 9. B. 16. C. 9. D. 10. e. 9. f^{*} 16. g.

IV. Two Flats.

G. 9. A. 16. B^b 10. C. 9. D. 16. E^b 9. F. 10. g. 9. a. 16. b^b.

V. Two Sharps.

B. 9. C^{*} 16. D. 10. E. 9. F^{*}. 16. G. 9. A. 10. b. 9. c^{*}. 16. d.

VI. Three Flats.

C. 9. D. 16. E^b 10. F. 9. G. 16. A^b 9. B^b 10. c. 9. d. 16. e^b.

VII. Three Sharps.

F^{*} 9. G^{*} 16. A. 10. B. 9. C^{*} 16. D. 9. E. 10. f^{*} 9.
g^{*} 16. a.

By

By this may we understand what a Key is, and observe a series of Notes in their just Proportions passing on from the sound first given to the Octave: The Keys with Lesser Thirds have always in the first place a 9th part of the String, then a 16th part, and so on till you come to the same Letter again in a lesser Character: The Keys with Greater Thirds have always in the first place a 10th part, then a 9th and so on till you come to the same Letter again; but the three last Letters are in a lesser Character, to shew, that as you began a Lesser Third short of the other, so you go a Lesser Third beyond it.

Thus you have as many Keys provided for you, as need be used; some things indeed have been set with four Flats, but they are very difficult to the Practiser, and I never saw any of them published; but if it were requisite, other Finger-boards might also be made for them, by the same Rule as these are calculated.

I know the Keys B and F^{*} with Lesser Thirds are seldom used, but D and A with Greater Thirds are: Now because the same Finger-boards that serve for the two later, serve also for the two former, and the Practiser may have them into the bargain, I thought it better to give these also, than to omit any thing that might easily be useful. When the Composer finds that the Instrument goes well in tune upon these Keys, he will not hereafter be so much afraid of them.

This Calculation in the Tables is but for one length, *viz.* of 28 Inches from the Nut to the Bridge, and but for one Tuning upon the Viol; but the Workman may be directed from these Proportions given to fit them to the length of any Instrument: and from the Key given in

in any Lyra tuning, for any sort of fretted Instruments, he may find out what Proportions fall upon every String.

Indeed Harpsichords and Organs, and such Instruments, where Frets are not used, cannot be accommodated the same way; but the Proportions and order of the Notes, are the same in them: They have something that makes the different gravity and acuteness of their Sounds, which may be so rectified, as also to render their Musick in a Mathematical perfection; but this is left to the ingenuity of the Artificer.

I shall now observe something particularly of the Tables of Proportions, according to the numbers of the forementioned Keys, which you will find prefixed at the head of each of them, as they are annexed to the end of this Treatise.

You will find, Number I. That A and C will not allow the sixth Base and Treble-string to have their fifth Frets upon the fourth part of the String, which makes a true Practical Fourth to the String open: For besides the least *Diatonick* Note, there falling two greater Notes upon the Strings D open, the stop G at the fifth Fret falls a pretty deal sharper; and accordingly the Fifth and Sixth Bases will not be a good Fourth to one another, but the Fifth Base must be tuned Unison at that place where the Table is marked.

I have upon every Plate marked where the exact 4th and 5th and 6th part of the String falls, that you may see when the gradual Notes are not coincident with those larger Intervals, as in the forementioned case. Old Mr. *Theodore Steffins*, (though he knew not the Mathematical reason) yet to make some allowance for this, was wont to direct the tuning of those Strings sharper than ordinary;

ordinary; by this Table you will find exactly how much sharper the tuning and the stops must be.

Numb. II. In D and F with one Flat, you will find the same accident upon the fifth Base, where the same care must be taken, and all the Proportions will fall perfect.

Numb. III. In G and B^b with two Flats, you have another affair to be consider'd; which is the tuning the third String to the *Chromatick* Note at the fourth Fret of the fourth String, which causes those two Strings not to be a true greater Third to one another. The reason is, because E, to which the third String is commonly tuned, does not in these Keys (G and B^b with two Flats) fall upon the fourth, but the third Fret of the fourth String, which is E flat; so that the fourth Fret is now the *Chromatick* division between E flat and F: hence it follows also, that the first Fret upon the third String, which is F, is not the 16th part of the String, but the 17th, *viz.* the later part of that divided Note.

These two Accidents are all that I think need be taken notice of in all seven of them, because though they do occur in the rest, yet being of the same nature, the Reader will know how to understand them.

This may seem a difficulty and inconveniency; that after all, the Intervals of Musick could not every-where be given in perfect Proportions: And I will confess that there are a few instances wherein they cannot, as the lesser Note being the 10th part of a String, and the least Note which is the 16th part, will not make a true Lesser Third, that is the 6th part of the whole String.

But this does not proceed from the defect of this Proposal, Nature it self will have it so; Scholars are not

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to alter Nature, but to discover her Constitutions, and to give opportunity for the best management of all her Intrigues: I still perform my design, because I maintain those perfect and Mathematical Proportions in every place, where demonstration either requires or permits them.

That the Reader may know how few, and how easie to be avoided, these inconcinnous Intervals are, I will give him an account of all and every one of them: There are three in each Constitution of an Octave, which are exact and necessary to carry on the progres of single gradual Notes, but they must not be allowed in the Composition of Parts.

Inconcinnous Intervals from the Key C.

1. A Lesser Third, from the Seventh to the Ninth above the Key.
2. A Fourth, from the Second to the Fifth above the Key.
3. A Fifth, from the Fifth to the Ninth above the Key.

Inconcinnous Intervals from the Key A.

1. A Lesser Third, from the Second to the Fourth above the Key.
2. A Fourth, from the Fourth to the Seventh above the Key.
3. A Fifth, from the Seventh to the Eleventh above the Key.

This is the exactness, which Reason, guided by Mathematical Demonstration, requires of us; and this exactness

actness is rewarded by a proportionable pleasure; that arises from it. Indeed since Musical Ears, (especially where Sence has no great acuteness) are commonly debaught with bearings and imperfections, they may not perhaps at first observe the advantage offer'd; but I am sure Nature desires it, and will rejoice in those Proportions, which by the Laws of Creation she is to be delighted with.

Yet there may be many an one, who will not care either for the trouble or charge of changing Finger-boards; if some little thing would mend their Musick, it might be acceptable: I shall therefore add one more Table, Number VIII. which any person that uses a fretted Instrument, either Lute, Viol, or Gittar, may easily make use of, and find the benefit of it.

I call it the Lyrick Harmony, because our Lyra-tunings require all the Proportions to be most conveniently accommodated to the Strings open: Now if the Frets be placed at the distance assigned in this Table, they will be generally perfect.

This Table is calculated like the rest for a String 28 inches long from the Nut to the Bridge; but whatever length your instrument be, keep the same Proportions, and you will be right: a fourth part of a String is a fourth part, and the same Proportion, whether the String be longer or shorter.

For the first Fret then, take the 16th part of the whole String from the Nut, which is the least *Diatonick* Second that lies between B and C, between E and F; so that this will be always right, except in the *Chromatick* half Notes, not much used in Lyra Musick; but if the excellency of the Chroma be desired, then must the Pra-

&iser put himself to the expences of what has been formerly proposed : Jewels can never be had cheap.

For the second Fret you have two Lines, the uppermost is the 10th part, the lowermost is the 9th part of the whole String from the Nut ; we use no Proportion in Musick between the 16th and the 10th, as will appear by speculative Demonstration, and practical Experiment.

If the tuning be with a greater Third, then the second Fret had best stand upon the 10th part ; if the tuning be with a lesser Third, this second Fret had best stand upon the 9th part ; for in Lyra-tunings the Key is generally some string open, and you will find by the twofold constitution of an Octave in the former Chapter, that the lesser Third requires the greatest Second from the Key, which is the 9th part, as from A to B ; but the greater Third requires the lesser Second from the Key, which is the 10th part from C to D.

This may not be always convenient, in respect of Composition, and therefore the Practiser may set his Fret where he pleases between these two strokes, according as he desires his bearings : however it can't but be a very advantageous satisfaction, to know his Latitude within which he may be right, and above or below which he must be wrong : These are the bounds,

Quos ultra citraque nequit consistere rectum.

The third Fret must be the 6th part of the String from the Nut, which is the Proportion of a lesser Third to the String open ; for 'tis demonstrable, that in Musick we use no Proportion between the 9th and the 6th part : but if you are not to have a true lesser Third to the

the String open, as may sometimes happen, when the tuning does not well favour your design, you may then use what bearing you please.

The fourth Fret must be a 5th part of the whole String, as being the Proportion of a greater Third to the String open.

The fifth Fret must be a 4th part of the whole String, as the just Proportion of a Practical Fourth.

The length of the Plate would not suffer me to give the sixth and seventh Frets, which are upon Viols; but the direction is easie.

The seventh Fret must be just the third part of the whole String from the Nut, as being the grateful Proportion of a Practical Fifth.

The sixth Fret standing between the 4th and third parts of the String, may be usually placed in the precise middle, where you may make a stroke the Finger-board of your Viol: but if the tuning requires any important Note to fall upon it, then may you tune your Fret by moving it higher or lower, as its Octave upon some of the higher Frets requires.

Thus you may keep your former Gut-frets, which are movable and tyed quite cross the Viol; the strokes made upon the Finger-board, being as so many Landmarks, either to keep you just in the right, or else to give you aim in the Variation.

I acknowledge that this will not come near perfection in the Note-way, nor always do in the other; but 'tis an advantage to make a good guess, and not always to do things at random: If I travel without a certain Track, an Information that I must leave a Town a quarter of a mile on the right hand, is a satisfactory direction, though I am not to go thorough it.

For

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For a Conclusion of this Proposal, I need only add, that the truth of it is evident, both from Rational and Sensible Demonstrations ; for the usefulness and necessity of it, every Man that wears a Musical Ear shall be Judge ; the difference of Seconds, the greater and lesser Note, (which have hitherto been used without any regard) is so very considerable, that whoever takes but a transient view of them, will confess his Frets must be rectified, he cannot bear so great a deviation from what is truly in Tune ; and accordingly the Practical Master does rectifie them, when he passes from one suit of Lessons to another. For assigning these particular Proportions, and denying that others are now to be used (as was asserted in the Lyrick Harmony) the Author desires no longer to be trusted, than there shall appear an inclination in any to study the Arithmetical and Geometrical parts of Musick, which are ready to be published.

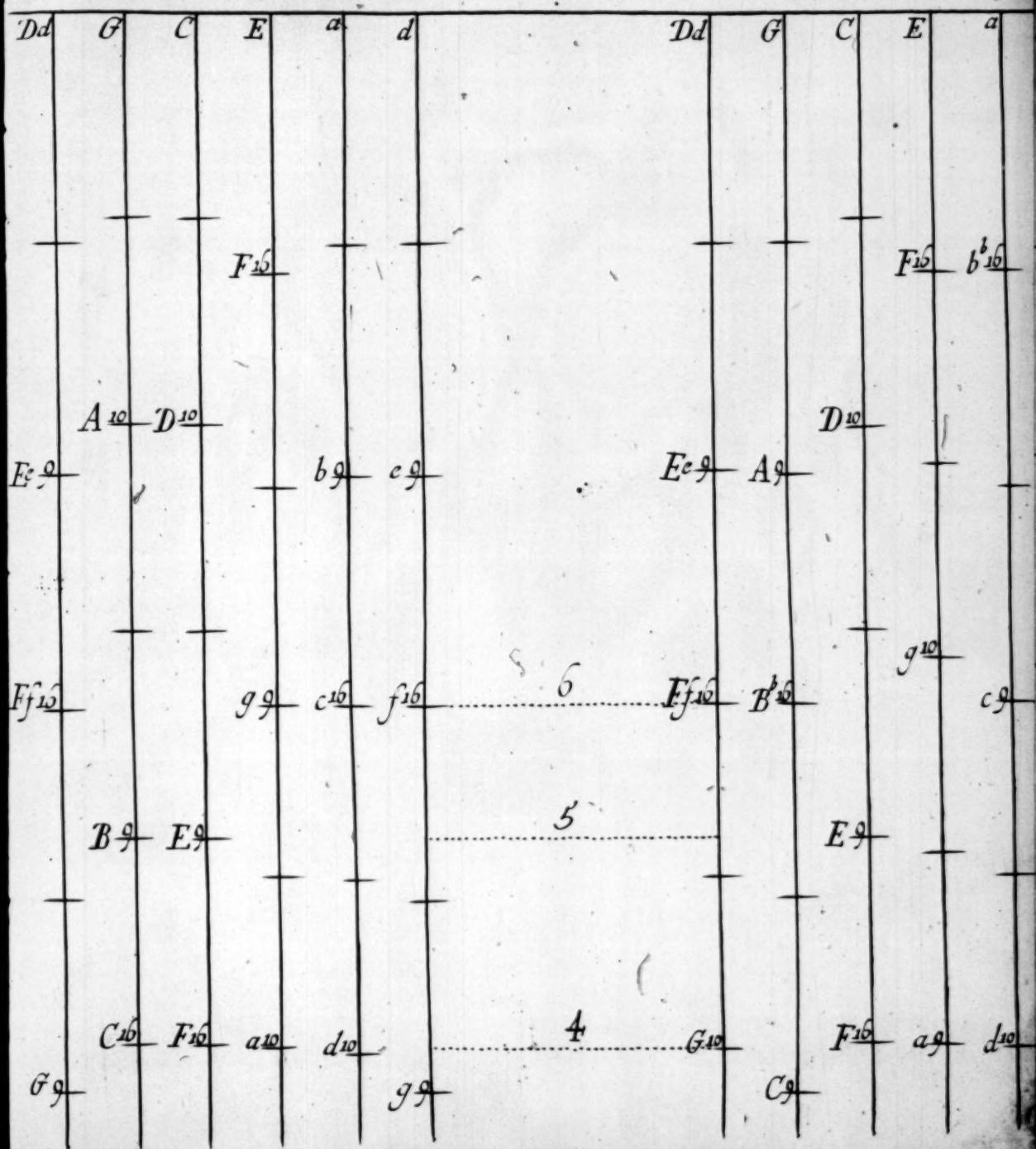
Musick in One Note.

B.6 C.10 D.9 E.16 F.9 G.10 A.

C.10 D.9 E.16 F.9 G.10 A.6 B.16 C.

D.9 E.16 F.10 G.9 A.16 b.9 C.10

E.10 G.9 A.16 b.9 C.10



H

E

H

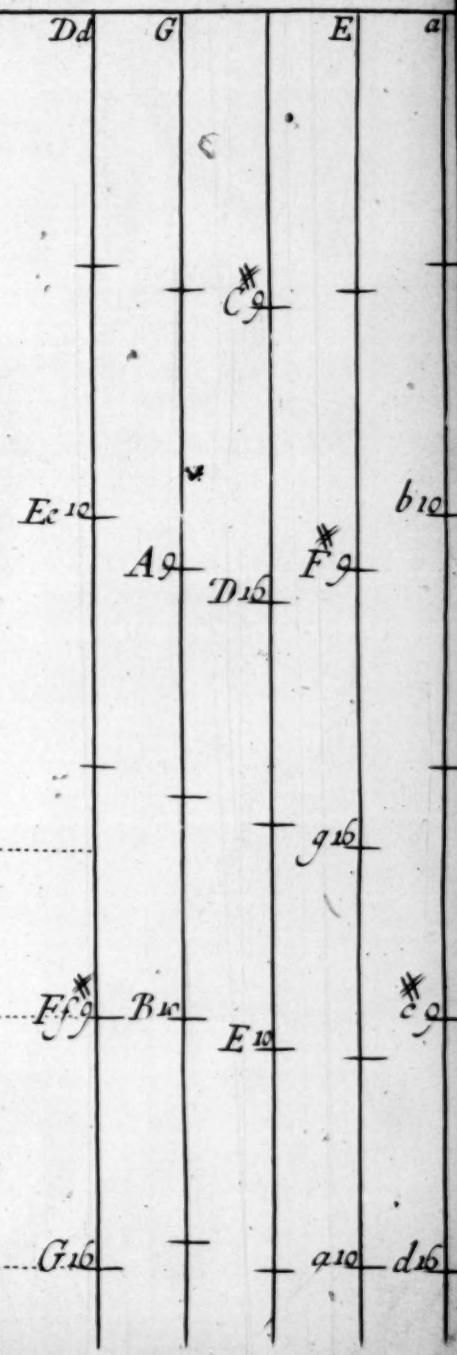
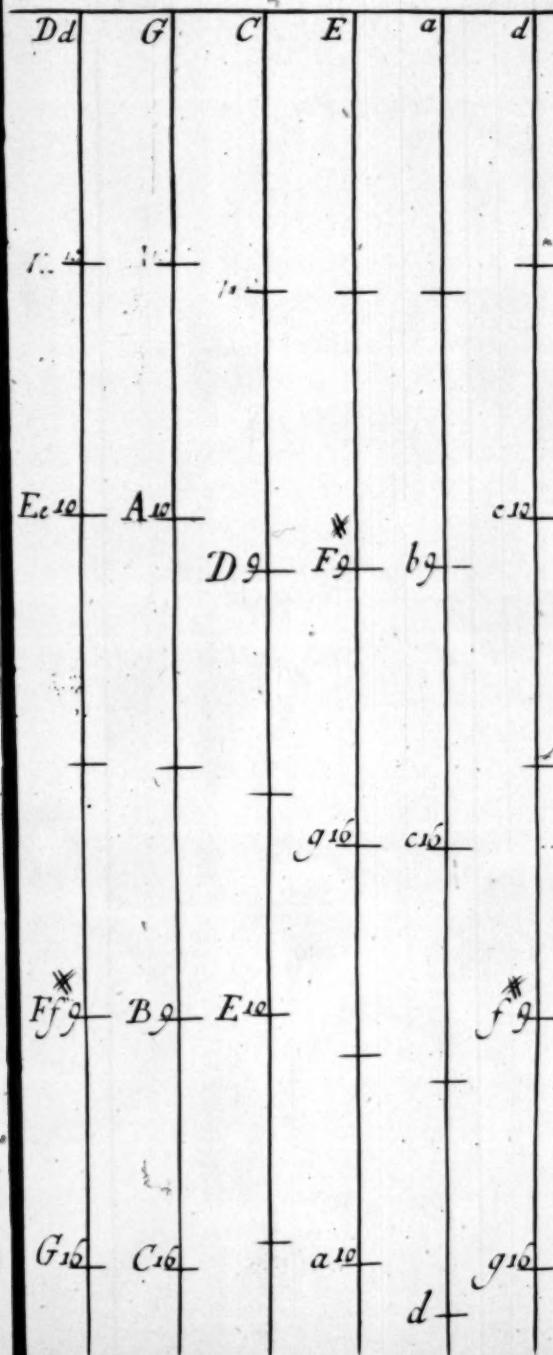
C

E.g.f.16.G.10.A.9.B.16.C.9.D.10.E

G.10.A.9.B.16.C.9.D.10.E.g.f.16.G

B.g.c.16.D.10.E.g.f.16.G.9.A.10.

D.10.E.g.f.16.G.9.A.10..



G.

E

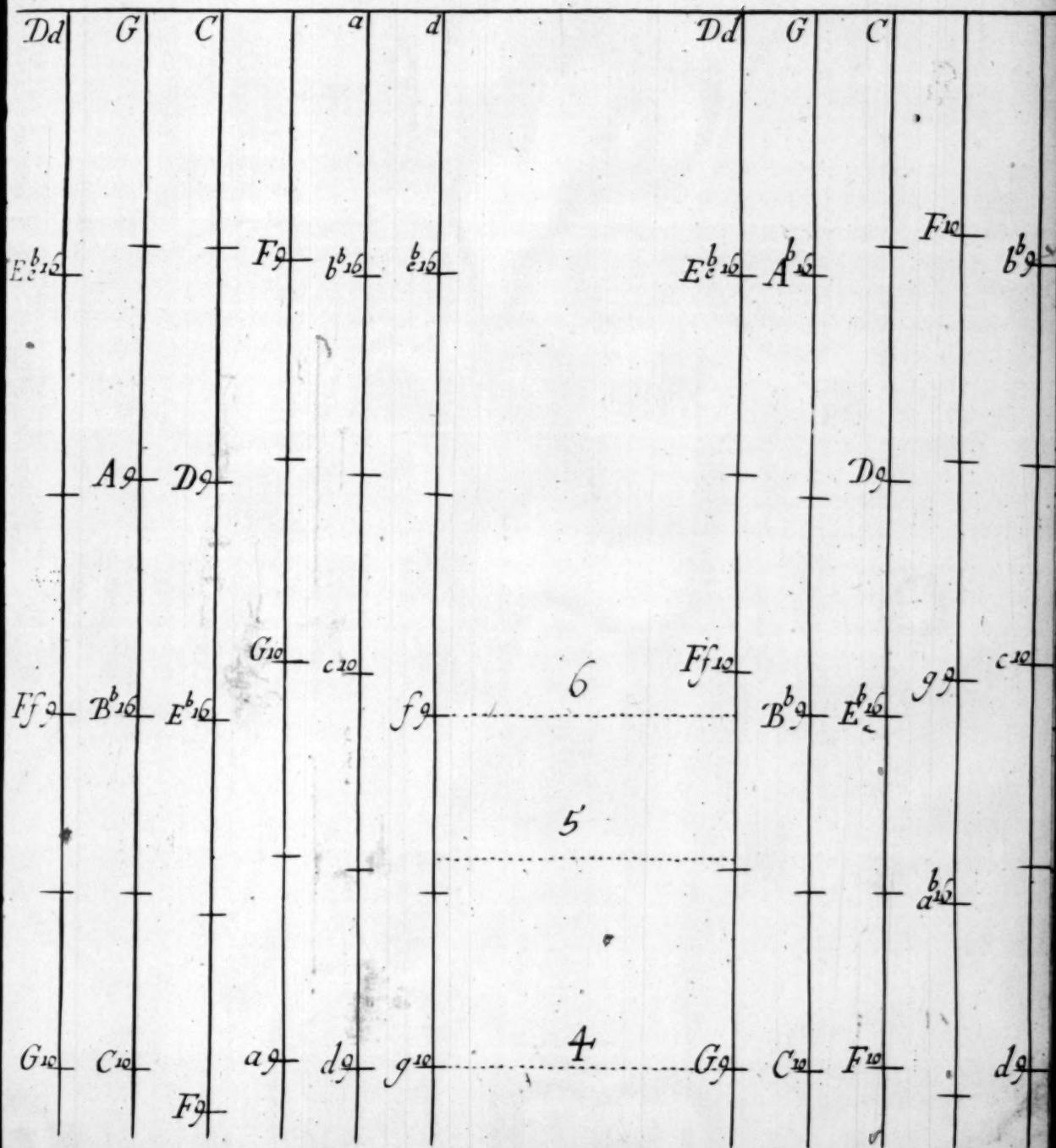
H

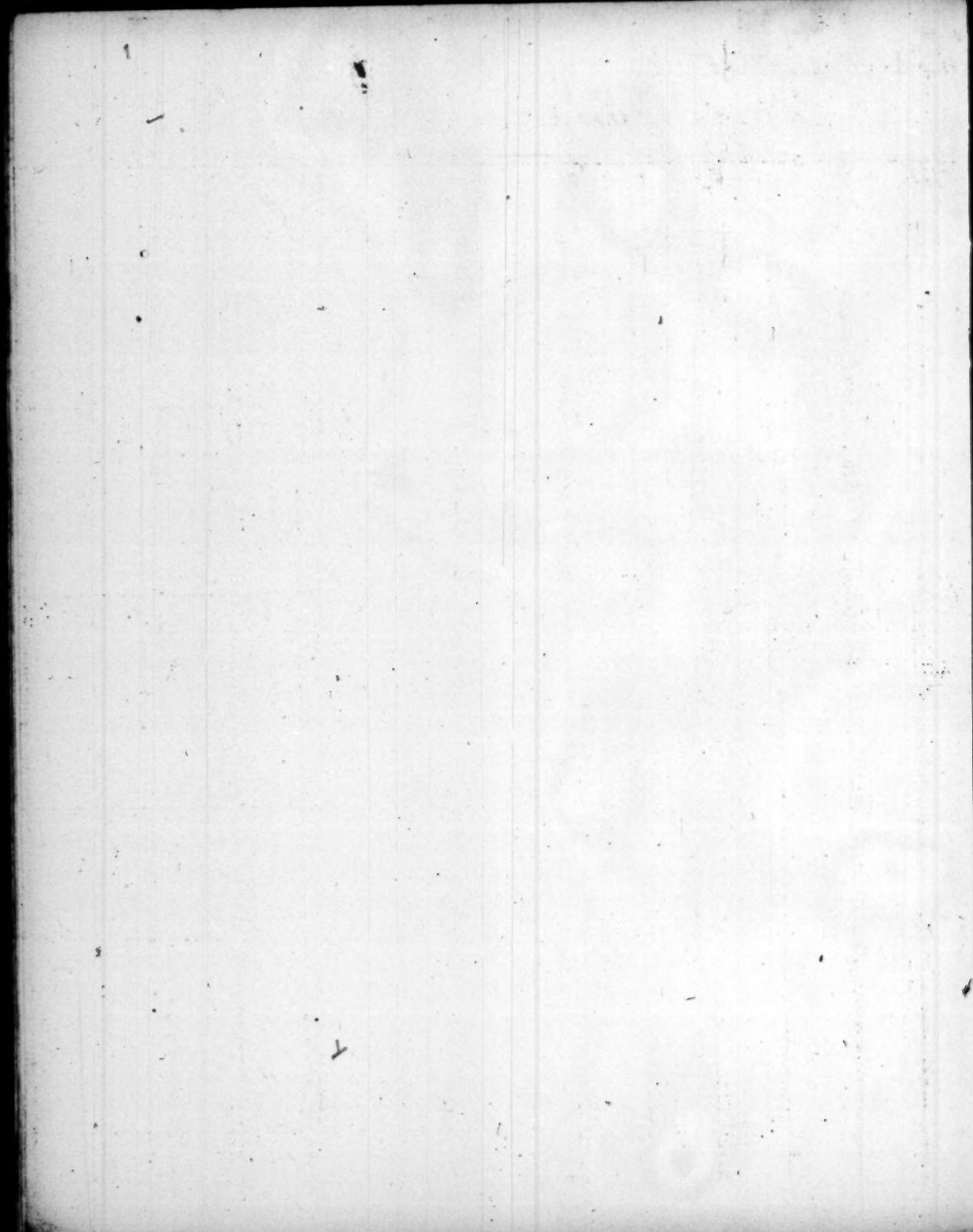
G.g.A.16.b^b.10.C.g.D.16.c^b.g.F.10.G

b^b.10.C.g.D.16.c^b.g.F.10.G.g.A.16.b^b.

VI
C.g.D.16.c^b.10.F.g.G.16.a^b.g.b^b.10.C

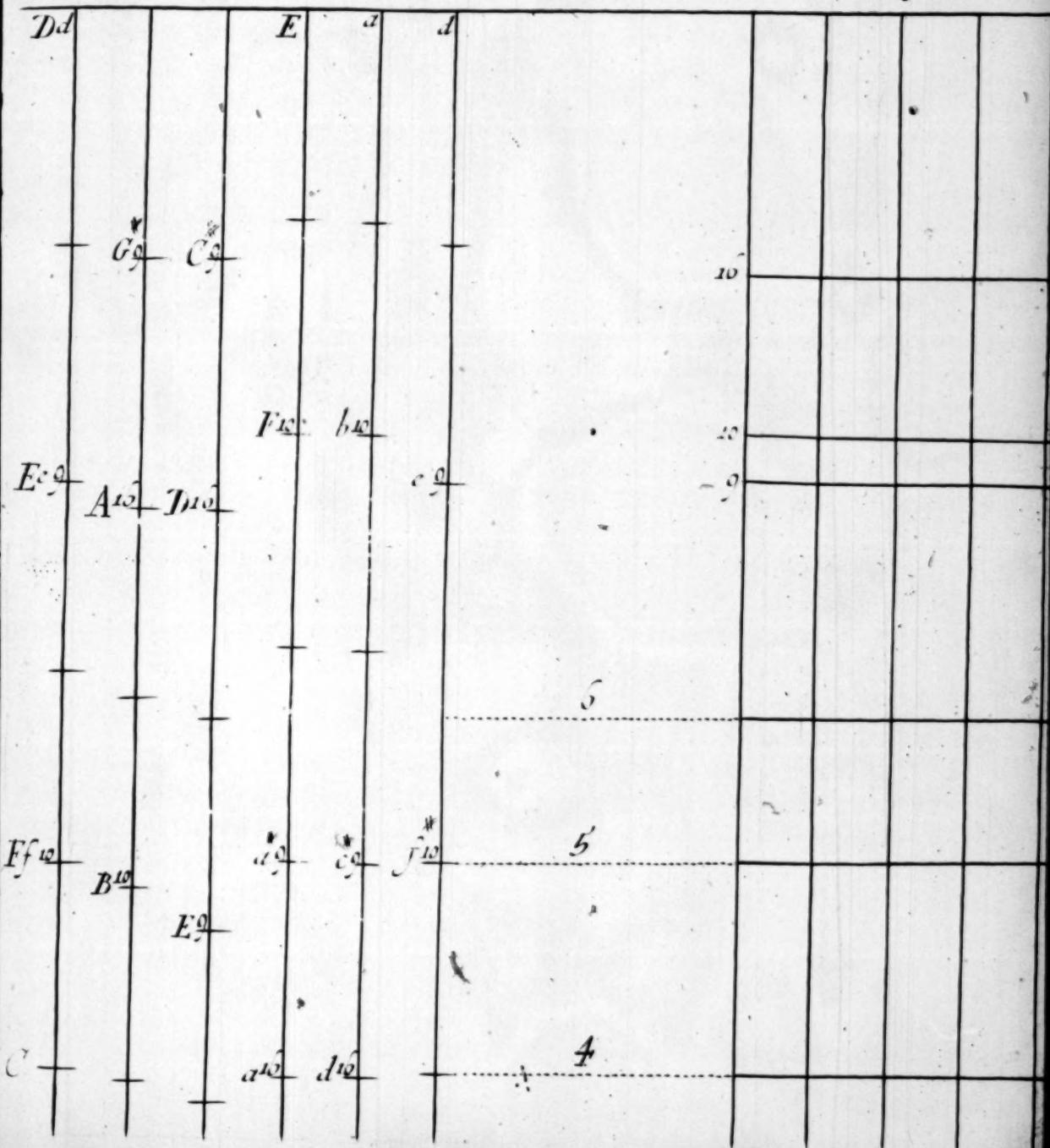
c.10.F.g.G.16.a^b.g.b^b.10.C





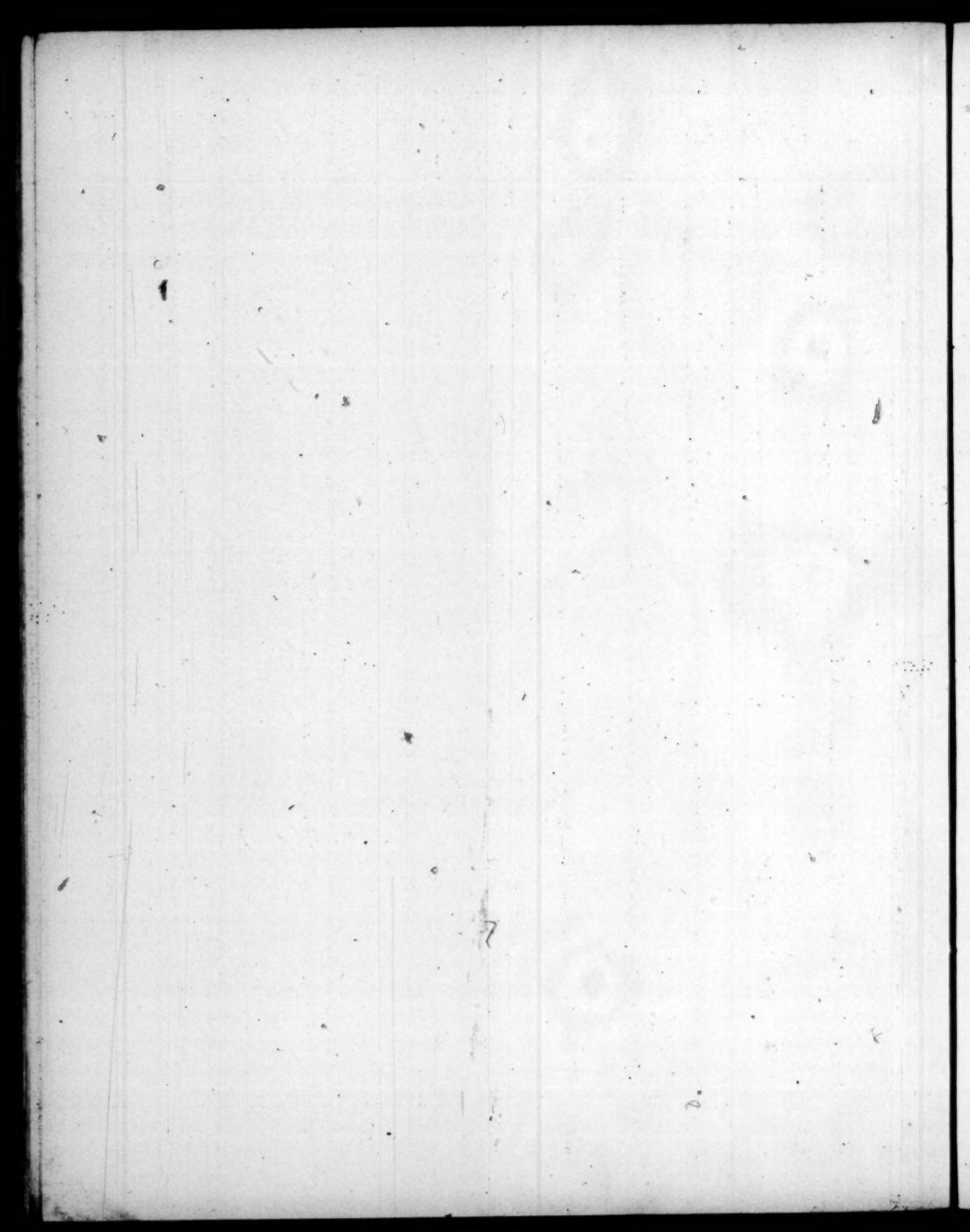
VII

A. B. C. D. E. F. G. H. I. J. K. L. M. N. O. P. Q. R. S. T. U. V. W. X. Y. Z.



VII

Harmon-Lyric:
Digit 28.



T O
Mr. THOMAS SALMON, M.A.
RECTOR of Mepsal in Hartfordshire.

Decemb. 17. 1687.

SIR,

Yours of Decem. 5. I received this week, with the printed Sheets, of which you desire my Judgment: which I did the next day consider of, and made some Remarks on them. Not by way of contradiction to your Design, (which I approve of) but for explaining some particulars, which seem either not so clearly, or not so cautiously expressed. An account of which I send you with this, from,

SIR,

Your Friend to serve you,
John Wallis.

REMARKS on the Proposal to perform Musick,
IN
Perfect and Mathematical Proportions.

Divers things you suppose therein, or take for granted, as agreed by those who have Philosophically discoursed of Musick; and thence proceed to what you direct, as to the Instrumental Practice thereof.

F

You

You first suppose, as agreed by all, (pag. 3. line penult.) that Musick consists in Proportion; and this Proportion (p. 4. l. 7.) twofold, in *Tune*, and in *Time*; meaning by that of *Time*, the different proportion of length and shortness of the intermixed Sounds; and by that of *Tune*, or *Tone*, their different greatness and acuteness.

There are some other things considerable, for the improvement of Musick: As, the different loudness and softness of the Sound or Voice, wherein a pleasing variety addeth much to the embellishment of the Musick, and may much conduce to that *Pathos* (or moving the Affections) which the Ancients seem much more to have affected than we do: And many other Appertenances to Musick, more remote from your present busines.

You tell us then, (p. 4. l. 26.) That *nove will pretend to Musick by playing good Time only, without that of Tune*. You might here have excepted the *Drum*, the *Tabor*, and the *Huntsmans Horn*; which make a kind of Musick (though not that which you are here treating of) by a due mixture of long and short sounds of the same Tone. And (as you there intimate, l. 10.) Dr. *Isaac Vossius* (in his Book *De Musica Rytmiis*) contends this to have been the Charming Musick of the Ancients, without taking notice of any difference of Tone thereto.

But this is not the part of Musick that you are treating of; but that other part which lieth in the proportion of Sounds, as to their Graveness and Acuteness, which by the Ancients was called *Harmonia*.

You next take for granted, (p. 5. l. ult.) that in order to this, we are to have a Series or Sequence of certain *Gradual Notes* or Sounds succeeding one another, by which the *Voice riseth and falleth*; and this in the best proportion possible; that by a due mixture of these in several orders (as by a mixture of Letters to make words), the whole Musick may be best composed: And such are those Notes which we now call by the names of *La mi fa sol la fa sol la*, (and so forth in the same Sequence) which make up what we call an *Octave*, and the Ancients a *Dia-pason*, (the last of one Octave beginning another, in the same order, and so onward as far as there is occasion); to which the Ancients gave the names of *Proslambanomenos*, *Hypate Hypaton*, *Parypate Hypaton*, and so onward to a double Octave, or *Dis-dia-pason*; and which, in *Guido's Gammut*, are called *Are, B mi, C fa ut, &c.* His *Are* answering to the Greeks *Proslambanomenos*, and the rest to the

the rest in order. (The original and reason of which names, I have given you elsewhere, and shall not here trouble you with them ;) but are now wont (by Writers of Musick) to be expressed by the initial Letters of these names, A, B, C, D, E, F, G ; and then (for another Octave) by small Letters, a, b, c, d, e, f, g ; and (for a third Octave) by small Letters of another shape, or by small Letters doubled, aa, bb, cc, &c. And, if there be occasion to go backward from Γ or GG, by double great Letters, FF, EE, DD, CC, &c.

And between every two of these Notes are certain Intervals, (as they are wont to be called) different according to their different proportions of the Graveness or Acuteness of those Notes each to other.

Tis next presumed (p. 4. l. 2. 7. p. 7. l. 2. 7.) as agreed on all hands, that the little Intervals (between Note and Note next following) are not all equal. In the Diatonick Musick of the Greeks, and in Guido's-Gammus, they are accounted to be *Tones* and *Hemitones* intermixed ; or, as we now call them, *Notes* and *Half-notes*, in this order.

A.	B.	C.	D.	E.	F.	G.	a.	b.	c.	d.	e.	f.	g.	aa.	&c.
la.	mi.	fa.	sol.	la.	fa.	sol.	la.	mi.	fa.	sol.	la.	fa.	sol.	la.	&c.
t.	h.	t.	t.	h.	t.	t.	t.	h.	t.	t.	h.	t.	t.	t.	

Not that they are exactly such, but near the matter. And what is the exact proportion of each, we are after to consider. What it is in the Chromatick or Enarmonick of the Greeks, comes not into our present Enquiry.

And here we are to take notice of the ambiguous or double sense of the word *Note*. Before, it signified one particular Sound or Note, as la, mi, fa, &c. but here, when we speak of *Notes* and *Half-notes*, it signifies an Interval between Note and Note. The Greeks had two words for it, *Pbthongus*, and *Tonus* ; but we use *Note* promiscuously for both.

In an Octave thus constituted, from *mi* to *mi* (or from *B* to *b*, which is the natural place of *mi*) there are five Tones, and two Hemitones ; (*fa* rising every-where half a Note, and the rest a

whole Note :) and, therein two *Tetrachords* or *Dia-tessaron's*, or (as we call them) *Fourths* ; where, from *mi* or *la*, we rise by *fa sol la*, (that is, *mi fa sol la*, or *la fa sol la*, according as *mi* or *la* come next before *fa* ;) and moreover, one *Tone*, or whole Note, *la mi* : which added to the *Tetrachord*, either next before it, or next after it, makes a *Pentachord* or *Dia-pente*, which we call a *Fifth* ; whereby the *Octave* is near equally divided into a *Fourth* and a *Fifth*, as *BE* and *Eb*.

And the same we have, for quantity, in any other *Octave* ; as from *A* to *a*, from *C* to *c*, &c. though not in the same order : for the same Notes still return after one *Octave*, in the same sequence as before, the last Note of one *Octave* being the first of the next ; so that what is cut off at the one end, is supplied at the other, at what place soever we begin : but the order is different. If we begin at *A*, then is *la mi* (the odd Note) in the first place, (before the two *Tetrachords* :) If at *B*, 'tis in the last place (after both :) If at *E*, 'tis just in the middle between both, (and will make a *Pentachord* with either.) If at any other place, one of the *Tetrachords* will be divided ; and what of it is wanting at the one end, will be supplied at the other end of the *Octave*.

Suitably hereunto, the *Greeks* observed seven Species or sorts of *Octaves*, (all equal in quantity, but different in order) according to their different beginnings. The first *Aa*, and second *Bb*, the third *Cc*, &c. of which each had its peculiar name.

The first of them begins at *A*, which was their *Proslambanomenos*, (a sound given, or assumed,) answering to what our Musicians now call the *Key* : A Note at which (in the Base-part) the Song begins, and to which great respect is had through the whole. The other Species had their several beginnings, or respective *Keys*.

Which, and how many of these, they did make use of in their Musick, is hard to say. Our Ancestors, about *Guido's* time, seem chiefly to have affected that of *G* ; as appears by their Scale beginning at *Gamm-ut* ; and their Series of Notes, *Ut re mi fa sol la* : where we have two Notes lower than *mi*. And our Musick-Masters, to this day, when they teach to sing, begin commonly with *sol la mi fa*, &c. as if *ut*, or the nearest *sol* below *mi*, were the Key or Note most regarded. Beside which, they seem (by the *Gamm-ut*) to have had two more (upon a remove) but of the same

same constitution, at C, and F, where (in the *Gamm-ut*) the Note *si* returns again.

For twenty years last past, you tell us (p. 7. l. 29. p. 8. l. 2.) in the compositions of the most eminent Masters, they scarce make use of any other Key (as to the internal constitution of the Octave) than A and C. That is, their Key or leading Note, at which their Base-part begins, is either *la* next before *mi*, or *fa* next above *mi*. And, because you are much better acquainted with the eminent Masters of Musick, and their Compositions, than I am, I take it, as to matter of fact, so to be. But at whatever Note they please to begin, and make it their Key, it is, as to this point, much one.

If these Keys be transferred to any other place (to accommodate the Voice or Instrument) *mi* is transferred also, (by help of Flats and Sharps) and the other Sequence of Notes with it; which alters the *Pitch* but not the *Tune* (p. 8. l. 3, 12.) that is, the same Tune is sung by a higher or lower Voice.

As for instance: If I would remove these Keys from A and C, to B and D, (that is, if I would set the whole Tune a Note higher) then must *la* (which is now at A) remove to B, and *mi* (from B) to C, and *fa* to D, and so forth. But then I find, that BC (an Half-note) is not wide enough to receive *la mi*, (a whole Note :) and therefore C (by a Sharp) must be raised half a Note higher, that BC* may be fit to receive *la mi*; and thence to D, will remain half a Note for *mi fa*; thence to E, an whole Note for *fa sol*; but thence to F, is but half a Note, not capable of *sol la*, an whole Note: and therefore F (by another Sharp) must be advanced half a Note higher, that EF* may receive *sol la*; and F* G receive *la fa*, (an Half-note ;) and G a receive *fa sol*; and b receive *sol la*; and then bc* receive *la mi*, and so forth. So that C and F must every-where have a *Sharp*, but the other Notes remain as before, in this form.

B. C*. D. E. F*. G. a. b. c*. d. &c.
la. mi. fa. sol. la. fa. sol. la. mi. fa. &c.
t. h. t. t. h. t. t. t. h.

In like manner, if I would bring back A and C, to F and B; that is, if I would let the Tune a Note lower; then must la come back to F, and mi to A, and fa to B, and so forth. But because AB (an whole Note) is too wide for mi fa (an Half-note) there B (by a Flat) must be taken down half a Note; that is to AB may just receive mi fa, and (instead of BC an Half-note) B C (an whole Note) receive fa sol; and (for a like reason) another Flat at E. And so every-where at B and E. The rest remaining as before, in this form.

G. A. B^b. C. D. E^b. F. G. a. b^b. &c.

la. mi. fa. sol. la. fa. fol. la. mi. fa. &c.

t. h. t. t. h. t. t. t. h.

And the like in other cases; of which you give us the particulars, at pag. 20.

And it is, in effect, no other than the common Rules by which Learners are taught to find mi: Only there, by the Flats and Sharps we find the place of mi; and here, by the assigned place of mi, you find the Flats and Sharps, if any be.

Of those two Keys, at A and C, in their natural position, you observe aright (p. 7. l. 31. p. 8. l. 21. p. 21. l. 3.) that if you begin at A, then are C, F, G, the *lesser* Third, Sixth, and Seventh, from the Key: If at C, then are E, a, b, the *greater* third, Sixth, and Seventh, from the Key. And therefore the Composer, if he design those, should chuse the Key A; if these, the Key C: or the equivalents of these transferred (as is shewed) to other places.

And thus far we have pursued the Language of Aristoxenes and his Followers the Aristoxeneans, and the Practical Musicians, who content themselves with the names of Notes and Half-notes, without enquiring into the Proportions of each Interval.

But Pythagoras and his Followers, whom you call the Speculative Musicians, enquired further into the Proportions (of Graveness and Acuteness) at several Intervals.

And

And here it was first discovered by Pythagoras, and since admitted by all, (which therefore you suppose as granted,) that the Proportion for an Octave (as A a, or Bb,) is Double, or as 2 to 1 : That for a Fifth, (as AE, or Eb,) Sesquialters, or as 3 to 2 : That for a Fourth, (BE, or Ea,) Sesquionters, or as 4 to 3 : And consequently, that for the Tone (AB, or ab,) Sesquiduare, or as 9 to 8. Hence Euclide (in his *Musical Introduction*, and *Section of the Canon*) taking all Tones to be equal, computes, that for the Ditone, *fa sol la*, to be as 8 to 64, (which is the duplicate of 9 to 8;) and therefore the Hemitone *mi fa*, or *la fa*, to be so much as that wants of a Fourth; that is, 246 to 243 : which is somewhat less than half a Tone, or the sub-duplicate of 9 to 8. And so Boethius (after him) and others downward, till that (about an hundred years ago) Zarline revived the Doctrine of Ptolemy in this point.

That of Ptolemy (in his *Harmoticks*) is this: The Proportions for the Octave, the Fifth, and Fourth, he retains as before; and that of the Diatonic Tone *la mi*; which, together with the two Fourths, compleat the Octave; and both, with either of them, compleat the Fifth. (And so far Pythagoras proceeded, and no further.) But the Ditone *fa sol la*, (which is the greatest Third,) he reckons to consist of two Tones, but unequal. The one as 9 to 8, (which is called the *major* Tone, and is equal to that of *la mi*;) the other as 10 to 9, (called the *minor* Tone:) and therefore the Compound of both, as 9 to 4; (which is a much more Musical Interval, than 8 to 64.) And consequently the Hemitone or Half-note *mi fa*, or *la fa*, (so much as wanting of $\frac{1}{4}$) as 16 to 15, (which is somewhat more than half a Note:) and this together with a major Tone, (which make the lesser Third) as 6 to 5; as *la mi fa* (from A to C,) or *la fa sol* (from E to G,) or *mi fa sol* (from B to D) taking *fa sol* for a major Tone, and therefore *sol la* for a minor Tone.

These Proportions settled by Ptolemy, (for the Diatonick kind) were afterward disused, till revived by Zarline about a hundred years since; who is followed by Kepler, Mersennus, Cartes, Gassendus, and others, (p. 14. l. 15.) and generally admitted by Speculative Musicians since Zarline's time. And these you pre-suppose (upon their Authorities) referring to their Reasons for it.

You pre-suppose further, (which *Ptolemy* had shewed at large, and is since admitted) that (in the same or like String) the degree of Acuteness is in counter-proportion to the length: That is, if the Acuteness of the sound be as 2 to 1, (as in the upper Note of an Octave) the length of the String is as 1 to 2, (the Sound twice as sharp, the String half so long.) And where the Acuteness of the Sound is as 3 to 2, (as in the upper Note of a Fifth) the length is as 2 to 3. Where that is as 4 to 3, (as in a Fourth) this is as 3 to 4. Where that is as 5 to 4, (as in the greater Third) this is as 4 to 5. Where that, as 6 to 5, (as in the lesser Third) this, as 5 to 6. Where that, as 9 to 8, (as in the greater Tone) this, as 8 to 9. Where that, as 10 to 9, (as in the lesser Tone) this, as 9 to 10. And thus every-where, the length of the String is in the counter-proportion to the height or sharpness of the Sound.

These things being premised, or pre-supposed, you proceed to the Constitution of the Keys A and C, (p. 9. and p. 12.) where, by 9, 16, 10, you mean $\frac{1}{2}, \frac{1}{4}, \frac{1}{3}$, (which, I suppose, you so expressed, lest the small Fraction-figures should not be so easily seen and read.) And so, by 6, 4, 3, 2, (the portion of the String from the Nut to the Fret, for the Key A) you mean $\frac{1}{3}, \frac{1}{2}, \frac{1}{3}, \frac{1}{2}$, (suitable to $\frac{1}{2}$ and $\frac{1}{3}$:) And (for the Key C) by 5, 4, 3, 2, you mean $\frac{1}{2}, \frac{1}{3}, \frac{1}{2}, \frac{1}{3}$, (in the same sence with $\frac{1}{2}$ and $\frac{1}{3}$;) according the Exposition your self gives, pag. 9, 10, 11.

I should rather have chosen to express the place of the Fret, by the length of the other part of the String, from the Bridge to the Fret, than from the Nut to the Fret: (For it is that, not this, that gives the Sound.) In this manner.

A ; B	$\frac{8}{12}$	$\frac{5}{12}$	$\frac{3}{12}$	$\frac{2}{12}$	$\frac{5}{12}$	$\frac{5}{12}$	$\frac{1}{12}$
C ; D	$\frac{9}{12}$	$\frac{6}{12}$	$\frac{4}{12}$	$\frac{3}{12}$	$\frac{8}{12}$	$\frac{9}{12}$	$\frac{2}{12}$

C ; D	$\frac{9}{12}$	$\frac{4}{12}$	$\frac{3}{12}$	$\frac{2}{12}$	$\frac{3}{12}$	$\frac{8}{12}$	$\frac{1}{12}$
E ; F	$\frac{10}{12}$	$\frac{5}{12}$	$\frac{4}{12}$	$\frac{3}{12}$	$\frac{5}{12}$	$\frac{15}{12}$	$\frac{2}{12}$

That

That is, from the Bridge to B, is $\frac{1}{2}$ of what it is to A; and from the Bridge to C, is $\frac{1}{3}$ of what it is to B: and so elsewhere. Again, from the Bridge to B, is $\frac{1}{2}$ of that whole String; from the Bridge to C, is $\frac{1}{3}$ of the whole. And so of the rest. But the sense is the same with that of yours.

But herein I dissent from you; namely, whereas you say, C 10 D 9 E; I would rather say, C 9 D 10 E. That is, of *fa sol la*, I would make *fa sol* the bigger Tone, and *sol la* the lesser; at C D E, as well as at F G a. And then my Proportions would stand thus:

	8	5	20	2	5	5	1
A $\frac{1}{2}$	B $\frac{2}{3}$	C $\frac{3}{2}$	D $\frac{5}{3}$	E $\frac{6}{5}$	F $\frac{7}{6}$	G $\frac{8}{7}$	a $\frac{9}{8}$
9	6	27	3	8	9	2	

	8	4	3	2	3	8	1
C $\frac{3}{2}$	D $\frac{5}{4}$	E $\frac{6}{5}$	F $\frac{7}{6}$	G $\frac{8}{7}$	a $\frac{9}{8}$	b $\frac{10}{9}$	c
9	5	4	3	5	15	2	

The reason why you did otherwise at C D E, than at F G a, is (I presume) that A D might be a true Fourth to the Key A. Whereas otherwise $\frac{5}{4}$ is a false Fourth. Though very near a true one: for $\frac{5}{4}$ would be a true Fourth, being the same with $\frac{1}{2}$.

My Reasons to the contrary, are these. First, a Fourth (now a days) is scarce allowed as a good Concord; and therefore the less to be regarded: especially at this place. For, I suppose, it is not usual, from A the Key, to rise a Fourth at one step; but rather a Fifth, or a Third. And when from the Key you rise an Octave at two steps, the Fifth always begins, and the Fourth follows, (not first a Fourth, and then a Fifth:) For a Fifth being much the sweeter, this is first chosen; and the Fourth, which follows, (though not of it self so sweet) is helped by being an Octave to the Key; which is in fresh memory, as being the Sound last heard but one. (And of an Interval never used, we need have the less regard.) And if from any other place we

move to D, the Note from whence we move (which was last heard) is more to be regarded, than the Key, which had not been heard for some while.

And then, by preserving this Fourth at A D, you spoil a good Third (which is more considerable) at D F, and again at B D, and a fourth at D G, and a Fifth at D a, and again at F D; and so leave no place from whence to move to this D. And if perhaps you will say from d; at that it is as hard to come as at this D. So that your D will be of no use at all.

And for such reasons, it was a Rule with the Greeks, that the two conjoined Tetrachords, *mi fa sol la*, at B C D E; and *la fa sol la*, at E F G a; should ever be divided in the same manner. For though they had their μετασολικά γένη ρύθμος, (a Transite from one kind of dividing the Tetrachord to another;) yet they would have this Transite to be always at the Disjunctive Tone *la mi*. Allowing to the Tetrachord above it, a different division from that below it; but not a different division to the two conjunct Tetrachords above it.

Again, if you make your Key at C, and thence sing *fa sol la*; it is most natural for the greater Tone to begin, and the lesser to follow. (Upon the same account as when we rise an Octave at twice, the Fifth leads, and the Fourth follows; and when at two steps we would rise a Fifth, it is most proper for the greater Third to begin, and the lesser to follow.) And therefore here, not to make *fa sol* the lesser Tone, and *sol la* the greater; but, that the greater, and this the lesser; as your self do at F G a.

And if, for these reasons, you give the same division to C D E, that you do to F G a; it will relieve all those *inconsonious Intervals* mentioned pag. 24.

I have now done with the Constitution of your two Keys at A and C, (and indeed of any other Key) in the natural Constitution. And consequently, with all the *Essential Flats* and *Sharps*, which serve only to remove it to a higher or lower pitch, without changing the sequence of the Notes: And which are wont to be noted at the beginning of the Tune, so as to influence the whole, without repeating them at the several Notes.

But,

But, besides these, there are some *Accidental Flats and Sharps.* which occur in the middle of the Musick, affecting some one Note. These you call *Chromatick Half-notes*, (p. 15. l. 10, 20. p. 18, l. 16.) which, you say, are truly made by placing the Fret exactly in the middle between the two Frets of the Diatonic whole Note wherein it falls. Which is not so cautiously expressed as not to be liable to a mistake. The Reader, by exactly in the middle, will be apt to understand an *Aritmetical middle*: as for instance, if FG be an Inch, FF* and F*G should be each of them half an Inch. Or, a *Geometrical middle*, (which we call a *mean Proportional*;) as, if the proportion for FG be as 8 to 9, that for FF* and F*G should be as 28 to 29 (the square Root of 8 to the square Root of 9.) Neither of which are your meaning. But you mean (I presume) a kind of *Musical middle*, which is thus to be taken: Supposing the Proportion for FG to be as 8 to 9, that is, (doubling both numbers) as 16 to 18; this is to be divided by help of the middle number 17. So that the Proportion for FF* shall be 16 to 17; and for F*G, 17 to 18. Which, together, make FG as 16 to 18, or 8 to 9. In like manner, if G a be as 9 to 10, that is as 18 to 20; then is GG* as 18 to 19, and G*a as 19 to 20: which, together, make 18 to 20, or 9 to 10. And this, I presume, (though the Book be not at hand) is the meaning of *Aristides* at the place cited; and your meaning here. And this, I suppose, may do pretty well in most places.

But if we would be exact, we must, in each place, consider, what is the particular design we aim at in such a Flat or Sharp; and make the division accordingly. As for instance, if to the Key A, instead of a lesser Sixth at F, I would have a greater Sixth at F*; I must not so much aim at such equal division (or near-equal) of FG; as, to take out of it so much as will make EF* a minor Tone, (whatever chance to be the remaining part to G.) Which will make for FF*, (not 16 to 17, but) 24 to 25. (For this, with 15 to 16, for EF, will make that for EF* as 9 to 10; and for AF* as 3 to 5, a greater Sixth; instead of AF as 5 to 8, a lesser Sixth.)

Sixth.) In like manner, if I would, from C, rise a Fourth to F, at two near-equal steps, (as when we rise an Eighth by a Fifth and Fourth; or a Fifth, by greater and lesser Third;) that is, if I would divide the Proportion of 3 to 4, or 6 to 8, into two near-equals; those are to be 6 to 7, and 7 to 8: And therefore CD \ddagger as 6 to 7, and D \ddagger F as 7 to 8, (whatever chance thereby to be the division of DE.) And the like for other cases. So that for instance, the same D \ddagger or F \ddagger , as to different purposes, shall signify differently. And such Arts we must make use of, if we would revive the Greeks Chromatick and Enarmonick Musick. But the Speculation is too nice for most of our present Practisers.

To return therefore to our Diatonick Notes, in their Natural or Primitive Constitution, together with their Essential Sharps and Flats incident upon removing the Key to an higher or lower pitch: having once fixed their Proportions as to the Monochord, (as supposing them all set off upon one String;) it is easie to transfer them to as many Strings as you please, (by the substitution of a smaller String, instead of a shorter distance) as you direct, p. 12. l. 9. And from thence to the Finger-board, p. 17. l. 23. p. 19. l. 25. p. 21. l. 17.

Nor do I take exception to any of your Numbers herein; save that I think D with its Octaves (or the Equivalent upon removing the Key to an higher or lower pitch) should be tuned somewhat sharper than you direct. And therefore you may, if you please, cause a Mark to be made for it, in each of your Finger-boards, (as is already done in that at Numb. VIII.) a little below yours, in such proportion as I have before directed: That so the Practiser may, at his discretion, make use of yours or mine, as his Ear shall direct him.

Your Reader also may be advertised, That though your Measures be fitted, on the Plates, (p. 21. l. 29.) to a String of 28. Inches; yet, on the Paper, they may chance to be somewhat less than so: For (being printed upon wet Paper); the Measures will shrink, as the Paper dries.

And,

Proposal to perform Musick, &c. 41

And, because (§. 18. l. 29.) you do not confine your Artificer to this Method (of distinct Finger-board) onely; you will give me leave to propose another. Which is (without changing the Finger-board) to have the Frets, for each String, to slide up and down in a Groove, (whereby they may be removed from place to place as you please) with Lines or Marks on the Finger-board (of several Colours, as Black, White, Red, &c.) at the place where every Fret is to stand for each Tuning. By help of which, the Practiser may at pleasure set his Frets to any of these Tunings, (or to any other upon emergent occasion) with what exactness he please; as well as in any unfretted Instrument.

Nor do we herein depart from the Ancients: For there are manifest places in *Ptolomy*, that their Frets (*μετάσητα*) were movable, not in Tuning onely, but even in Playing.

F·I·N·I·S.

To

To the Reverend
Mr. SALMON.

Reverend,

I Thank you for the great kindness of your Letter, of which I am altogether undeserving: And as for your good contrivance in the Art of Musick, I wish that the use of the Masters of that Art may not hinder the best Method to obtain. However, you have left a Specimen to Posterity, of what might have been done; and also by this Present, much obliged,

Reverend,

Oxon. Dec. 15.
1687.

Your Humble and
Affectionate Servant,

E. BERNARD.

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